REMARKS

Applicant acknowledges receipt of the Office Action dated November 6, 2002. In that action, the Examiner objected to claims 10-21 and rejected claims 10 and 21. Specifically, claims 10 and 21 are rejected under 35 U.S.C. 112 as being indefinite. Also, claims 10 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haneda et al. in view of Takada et al., and further rejected as being unpatentable over Haneda et al. in view of Takada et al., and further in view of Titus et al.

Rejection of claim 10 as unpatentable over Haneda et al. in view of Takada et al.

Claim 10, as rewritten, includes a throat having an inlet diameter which is greater than the outlet diameter. Figure 2 of Haneda shows the inlet and outlet diameters of the throat being equal, thereby creating a simple tubular or cylindrical shape for the throat. Accordingly, dependent claim 15 recites that the inner surface of the throat of the present invention has a wind tunnel profile, much unlike the simple cylindrical design of Figure 2 in Haneda. Therefore, Applicant respectfully submits that claims 10 and 15 are allowable over the art.

Additionally, as to new independent claim 34, the quench gasifier has a quench chamber with a gas outlet. Haneda et al. does not show a quench chamber with a gas outlet. Moreover, the throat of claim 34 has a curved, conical shape whereas the throat of Haneda has a uniform, tubular or cylindrical shape.

Also, as to dependent claims 33 and 36, the heating element extends into a portion of the combustion chamber. Haneda et al., along with the other cited art, simply show heating elements contained completely within the throat, and not extending beyond the throat into the combustion chamber.

Therefore, Applicant respectfully submits that independent claims 10 and 34 are allowable over the art, as are the remaining dependent claims that depend from allowable claims 10 and 34.

Rejection of claim 10 as unpatentable over Haneda et al. in view of Takada et al., and further in view of Titus et al.

Applicant references the above arguments in submitting to the Examiner that the relevant claims are again allowable over the art.

Claim Objections and Rejections under 35 U.S.C. 112

The Examiner's objections in paragraphs 4 and 5, and rejections in paragraphs 6-8 of the Office Action have been addressed via claim cancellations or amendments. Claims 10 and 15-20 should now be in an allowable form, as should be new claims 30-36.

Conclusion

Applicant respectfully requests reconsideration and allowance of the pending claims. If the Examiner feels that a telephone conference would expedite the resolution of this case, he is respectfully requested to contact the undersigned.

In the course of the foregoing discussions, Applicant may have at times referred to claim limitations in shorthand fashion, or may have focused on a particular claim element. This discussion should not be interpreted to mean that the other limitations can be ignored or dismissed. The claims must be viewed as a whole, and each limitation of the claims must be considered when determining the patentability of the claims. Moreover, it should be understood that there may be other distinctions between the claims and the prior art which have yet to be raised, but which may be raised in the future.

If any fees are inadvertently omitted or if any additional fees are required or have been overpaid, please appropriately charge or credit those fees to Conley, Rose & Tayon, P.C. Deposit Account Number 03-2769.

Respectfully submitted,

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Marked-Up Version Of The Specification and Claims Showing Changes Made

In the Specification:

Please replace the first paragraph under the section heading "BACKGROUND OF THE INVENTION" with the following paragraph, which is a marked-up version of the paragraph with deleted material in brackets, showing that the list of U.S. classes has been deleted. No new subject matter has been added.

[U.S. Class: 48/113, 48/77, 48/74, 48/69, 48/68, 48/61, 422/207, 431/350]

Quench gasifiers are used to gasify ash containing hydrocarbon feedstocks such as residual oils, waste lubrication oils, petroleum cokes and coal. A typical quench gasifier design is shown in Figure 1 (Reference: U.S. Patent No. 4,828,579). The feedstock, the oxidant and a temperature moderator (either steam or carbon dioxide) are injected into the top portion of the gasifier through a burner and are mixed with one another in the reaction zone below the burner. Steam and carbon dioxide (CO_2) moderate the temperatures in the reaction zone and also act as reactants. The partial oxidation reactions that take place in this portion of the gasifier, called the combustion chamber, maintain the combustion chamber temperatures in the 2000 to 3000 ^{0}F range. The combustion chamber is lined with refractory materials such as alumina. Approximately 90.0 to 99.5 percent of the carbon in the feedstock is converted to the synthesis gases (syngas).

In response to the Examiner's drawing objections, the Applicant makes the following amendments:

(a) Please replace the second paragraph under the section heading "BACKGROUND OF THE INVENTION," which is the first paragraph on page 2, with the following paragraph, which is a

marked-up version of the paragraph with deleted material in brackets and added material underlined. No new subject matter has been added.

The bottom portion of the quench gasifier, called the quench chamber, is separated from the combustion chamber by the floor of the combustion chamber as shown in Figure 1. The combustion chamber has an internal longitudinal length L_1, an external longitudinal length L_2, and an internal diameter D_1. A portion of the floor of the combustion chamber forms a constricted gasifier throat having an internal diameter D_2. The quench chamber is partially filled with water and is not lined with refractory. The quench chamber consists of three main components: the quench ring, the dip tube and the draft tube as shown in Figure 1. The main functions of the quench chamber are to cool down the synthesis gases generated in the combustion chamber by mixing them with water and to saturate the gases with water vapor.

(b) Please replace the first paragraph under the section heading "DETAILED DESCRIPTION OF THE INVENTION" on page 3 with the following paragraph, which is a marked-up version of the paragraph with deleted material in brackets and added material underlined. No new subject matter has been added.

A previous patent (U.S. Patent Number 4,574,002) suggests changing the shape of the gasifier throat to avoid ash deposits and plugs in this area. The wind tunnel shape proposed in U.S. Patent No. 4,574,002 is shown in Figure 2. The combustion chamber again has an external longitudinal length L_2 and an internal diameter D_1. However, the modified gasifier throat causes the internal longitudinal length L_3 to decrease compared to the length L_1 of Figure 1. Additionally, the modified gasifier throat has an internal diameter D_3. This shape provides a better chance of avoiding deposits and plugs in the throat area than the shape shown in Figure 1. However, the

wind tunnel shape is also susceptible to deposits and plugs particularly when feedstock contains metals or metal compounds that solidify at temperatures lower than 3000 ^{0}F due to the distance of the throat from the burner and its proximity to the quench ring component of the gasifier.

(c) Please replace the fourth paragraph under the section heading "DETAILED DESCRIPTION OF THE INVENTION," which is the third paragraph on page 4, with the following paragraph, which is a marked-up version of the paragraph with deleted material in brackets and added material underlined. No new subject matter has been added.

This new design will make it possible to control temperatures in any desired range in the throat area up to an upper temperature limit of about 3500 ^{0}F. The design proposed in Figure 3 shows an approximate wind tunnel shape, and a combustion chamber having an internal diameter D_1 and a modified gasifier throat having an internal diameter D_4. The throat does not have to be exactly in the wind tunnel shape. The essential features of this design are that the ratio D_1/D_4 [D1/D3] be in the range of 3 to 6 and that the diameter of the throat shape should decrease as you move away from D_1 [D1] portion of the throat.

Additionally, please reinstate the subject matter of claims 1-9 of the original application, which were canceled by Preliminary Amendment filed on April 19, 2000. Instead of presenting claims 1-9 as new claims, the Applicant respectfully requests that the Examiner insert the text of the claims at the end of the present specification. Please insert the following five (5) paragraphs at the end of the specification, which are marked-up versions of these paragraphs with deleted material in brackets. Applicant has only deleted the original claim numbers which were in parentheses, and has added no new text or new subject matter.

The new combustion chamber throat design, shown in Figure 3 and Figure 4, will be more successful in preventing plugging in the throat area[(Claim 1)]. This design will also eliminate the frequent damages that have occurred to the throat refractory[(Claim 2)], because silicon carbide and silicon nitride can withstand higher temperatures and the erosive and corrosive effects of vanadium oxide type compounds better than alumina.

This patent suggestion also proposes eliminating the plenum chamber area shown in Figure 2. The quench ring area of the traditional quench gasifier is prone to frequent damage (References: U.S. Patent No. 4,828,580 and Patent No. 4,828,579). This new design (shown in Figure 3) will be more successful in preventing damage to the quench ring than the designs shown in Figures 1 and 2[(Claim 3)], because the distance between the throat opening and the quench ring is longer in the new design. Overall, this new design will improve the gasifier on-stream time (reliability of operations) and thereby lower the gasifier operating cost[(Claim 4)].

The high temperatures obtained by electrical heating in the throat[are] will also increase the gasification reaction rates and thereby increase the carbon conversion of the gasifier by 0.1 to 3.0 percent[(Claim 5)]. This in turn will increase the syngas production of the gasifier without increasing either oxygen consumption or feedstock consumption[(Claim 6)].

The use of electrical heating and silicon carbide type refractories in the throat area will also reduce the consumption of the steam as a temperature moderator[(Claim 7)], because it will not be necessary to moderate the temperatures. Normally approximately 0.25 to 0.35 pound of steam is required for gasification of every 1.0 pound of residual oil or coke or coal. With this new design, the steam requirement will drop to 0.15 to 0.25 pound of steam per pound of feedstock.

Due to the increased carbon conversion achieved with this design, it will be possible to eliminate the soot recovery and soot recycle system that is normally employed downstream of the

gasifier. Thus electrical heating of the throat area will reduce the gasification plant capital cost[(Claim 8)]. The concept of electrical heating of the refractory can be extended to the entire gasifier hot face. If the entire hot face of the gasifier (not just the throat area) is electrically heated, it will be possible to preheat and cure the gasifier refractories electrically. There will be no need for using a preheat burner, a flue gas cooler and an aspirator (steam ejector) for preheating refractories. This will reduce the gasification plant capital cost further[(Claim 9)].

In the Claims:

10. (Amended) A quench gasifier for gasifying ash-containing hydrocarbon feedstocks, comprising:

a combustion chamber for partially oxidizing [the]carbon in [said]the feedstocks to produce synthesis gases; and

a quench chamber adjacent to said combustion chamber, said combustion chamber including a throat adjacent to said quench chamber for directing said gases from [the]said combustion chamber to [the]said quench chamber, characterized in that said throat includes:

an inlet adjacent to said combustion chamber, said inlet having an inlet diameter;

an outlet adjacent to said quench chamber, said outlet having an outlet diameter;

an inner surface and outer surface between said inlet and said outlet[, said face comprising a refractory material that can withstand temperatures of up to about 3500°F]; [and]

an electrical heating element [behind said face for heating said face to a temperature up to about 3500°F, such that components of said ash having solidification temperatures of up to 3500°F are substantially prevented from forming plugs in said throat]between said inner and outer surfaces; and

wherein said inlet diameter is greater than said outlet diameter.

15. (Amended) The quench gasifier according to claim [1]10 wherein said [throat has an] inner surface [having]comprises a wind tunnel profile.

16. (Amended) The quench gasifier according to claim [1]10 wherein said throat further comprises a layer of insulating refractory material [behind]between said electrical heating element and said outer surface.

17. (Amended) The quench gasifier according to claim [1]10 wherein [said inlet has an inlet diameter, said outlet has an outlet diameter, and] the ratio of [the]said inlet diameter to [the]said outlet diameter is at least [about] 3.

18. (Amended) The quench gasifier according to claim 17 wherein said ratio is in the range from [about] 3 to [about] 7.

19. (Amended) The quench gasifier according to claim [1]10 wherein [the]said quench chamber comprises a quench ring substantially axially adjacent to said throat outlet, such that [said]the quench gasifier does not include a plenum chamber.

30. (New) The quench gasifier according to claim 17 wherein said inlet diameter gradually and continuously decreases to said outlet diameter along said inner surface.

31. (New) The quench gasifier according to claim 10 wherein said heating element extends from said outlet to said inlet.

32. (New) The quench gasifier according to claim 31 wherein said heating element is a spirally wound member having a first diameter near said throat inlet and a second diameter near said throat outlet, and wherein said first diameter is greater than said second diameter.

33. (New) The quench gasifier according to claim 10 wherein said heating element extends from said outlet to above said inlet such that said heating element extends into a portion of said combustion chamber.

34. (New) A quench gasifier for gasifying hydrocarbon feedstocks, comprising:

a combustion chamber for partially oxidizing the carbon in the feedstocks to produce synthesis gases and slag;

a quench chamber adjacent to said combustion chamber, said quench chamber having a gas outlet for directing said gases away from said quench chamber; and

wherein said combustion chamber includes a throat for directing said gases and said slag from said combustion chamber to said quench chamber, said throat comprising:

an inlet;

an outlet;

an outer surface between said inlet and said outlet;

an inner surface between said inlet and said outlet;

a heating element between said inner and outer surfaces; and

wherein said inner surface has a curved, conical contour.

35. (New) The quench gasifier according to claim 34 wherein said heating element is near said inner surface such that said heating element substantially follows said curved, conical contour of said inner surface.

36. (New) The quench gasifier according to claim 34 wherein said throat inlet is adjacent to said combustion chamber, and said heating element extends beyond said inlet into a portion of said combustion chamber.